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PATENT APPLICATION
New Docket No.: 301505.1610-000
Prior Docket No.: 0050.1610-000

UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Jerry C. Chen

Application No.: 09/324,253 Filed Date: June 2, 1999

Confirmation No.: 1283 Group: 2633 Examiner: Payne, David C.

For: Optical Frequency Filter

CERTIFICATE OF MAILING
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TRANSMITTAL OF AMENDMENT UNDER 37 CFR 1.114

REQUEST FOR CONTINUED EXAMINATION (RCE)

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Advisory Action dated February 20, 2004 which was issued in reply to the Amendment After Final Rejection Under 37 C.F.R. 1.116 filed on February 2, 2004, and in lieu of filing a Notice of Appeal, Applicant's Attorney is filing a Request for Continued Examination (RCE) submitting the Amendment previously filed on February 2, 2004. Reconsideration and further examination are requested.

An extension to respond to the Office Action dated October 31, 2003 is respectfully requested. A Petition for Extension of time to respond to the Office Action and the appropriate fee are being filed concurrently with this Amendment and Response. Authorization is given to charge any additional fees due for this submission to Deposit Account No. 50-1935.

The amendment is being resubmitted for reconsideration based on the February 20, 2004 Advisory Action wherein the examiner's comments indicate the need for a new search in light of the February 2, 2004 Amendment after Final.

CONCLUSION

In view of the attached amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone call would expedite the prosecution of this case, the Examiner is invited to call the undersigned at (508) 416-2474.

Respectfully submitted,
BOWDITCH & DEWEY, LLP

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Expedited Procedure under 37 C.F.R. 1.116
Examining Group: 2633
Docket No.: 301505.1610-000

UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Jerry C. Chen

Application No.: 09/324,253 Filed Date: 6/2/1999

Confirmation No.: 1283 Group: 2633. Examiner: Payne, D.C.

For: Optical Frequency Filter

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on February 2, 2004 Sharon R. Lloyd
Date Signature

Sharon R. Lloyd
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AMENDMENT AFTER FINAL REJECTION UNDER 37 C.F.R. 1.116

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Amendment is being filed in response to the Final Office Action ("the Office Action") mailed from the U.S. Patent and Trademark Office on 10/31/2003 in the above-identified application. Reconsideration and further examination are requested.

It is not believed that any extension of time is required; however, if it is determined that an extension or other fees not already accounted for herewith are required, authorization is given to charge any additional fees due for this submission to Deposit Account No. 50-1935.

The listing of claims begins on page 2.

Remarks begin on page 8.

Please amend the application as follows:

Amendments to the Claims:

The following listing of claims replaces all prior versions and listings of claims, in the application.

Listing of Claims

1. (Currently amended) An optical frequency filter comprising:

a frequency dependent disperser that disperses ~~an~~ a frequency modulated input optical signal to form a dispersed signal having a plurality of frequencies;

a ~~frequency selective~~ modulator that modulates at least one of the plurality of frequencies to generate a spatially mapped, dispersed signal; and

a frequency dependent combiner that combines the frequencies in the dispersed signal to form an intensity modulated output signal, wherein the transmitted power of light through the filter is a varying function with respect to frequency over a selected bandwidth.

2. (Canceled)

3. (Previously presented) The optical frequency filter of Claim 1, wherein transmission of light through the filter is a monotonically varying function with respect to frequency over the selected bandwidth.

4. (Previously presented) The optical frequency filter of Claim 1, wherein the transmission of light through the filter is linear as a function of frequency over the selected bandwidth.

5. (Previously presented) The optical frequency filter of Claim 1, wherein the modulation of light depends on time.

6. (Previously presented) The optical frequency filter of Claim 1, further comprising a circulator that is optically coupled to an input optical waveguide and the disperser.

7. (Original) The optical frequency filter of Claim 1, wherein the frequency dependent disperser comprises a device having time delays which depend on frequency.

8. (Previously presented) The optical frequency filter of Claim 7, wherein the disperser comprises a fiber grating having a Bragg frequency that is an exponential function of position.

9. (Previously presented) The optical frequency filter of Claim 1, wherein the modulator and the combiner comprise a grating.

10. (Original) The optical frequency filter of Claim 1, wherein the frequency dependent disperser comprises a device having a plurality of one of positions and angles which depend on frequency.

11. (Previously presented) The optical frequency filter of Claim 1, wherein the frequency dependent disperser comprises a diffraction grating.

12. (Previously presented) The optical frequency filter of Claim 1, wherein the frequency dependent disperser comprises a prism.

13. (Previously presented) The optical frequency filter of Claim 1, wherein the frequency dependent disperser comprises an array of waveguide gratings.

14. (Previously presented) The optical frequency filter of Claim 1, wherein the frequency dependent disperser comprises a modified waveguide grating router.

15. (Currently amended) ~~The optical frequency filter of Claim 1, wherein the frequency selective modulator comprises~~ An optical frequency filter comprising:

a frequency dependent disperser that disperses a frequency modulated input optical signal to form a dispersed signal having a plurality of frequencies;

a modulator comprising ~~an~~ attenuator ~~or~~ that modulates at least one of the plurality of frequencies; and

a frequency dependent combiner that combines the frequencies in the dispersed signal to generate an intensity modulated output signal, wherein the transmitted power of light through the filter is a varying function with respect to frequency over a selected bandwidth.

16. (Currently amended) In an optical communications network, ~~A~~ a frequency modulation (FM) to intensity modulation (IM) converter comprising:

a frequency dependent disperser that disperses a frequency modulated light signal into a plurality of frequencies;

a ~~frequency selective~~ modulator that modulates at least one of the plurality of frequencies to generate a spatially mapped, dispersed signal; and

a frequency dependent combiner that combines the frequencies in the dispersed signal ~~and attenuated frequencies~~ to form an intensity modulated output signal, wherein the transmission of light through the converter is a varying function with respect to frequency over a selected bandwidth.

17. (Previously presented) The converter of Claim 16 wherein transmission of light through the converter is linear as a function of frequency over the selected bandwidth.

18. (Original) The converter of Claim 16 further comprising an input optical fiber, a fiber grating and an output optical fiber.

19. (Previously presented) The converter of Claim 16 wherein the disperser and combiner comprises a fiber grating.

20. (Original) The converter of Claim 18 wherein the modulator is coupled to at least one of the disperser and combiner.

21. (Original) The converter of Claim 16 further comprising a fiber grating and at least one device that allows light to propagate in a predetermined direction.

22. (Original) The converter of Claim 21 wherein the device that allows light to propagate in a predetermined direction further comprises at least one circulator, the circulator being coupled to the disperser and the combiner.

23. (Original) The converter of Claim 16 further comprising a mirror and a grating that forms the disperser and the combiner such that the mirror reflects the dispersed light from the grating onto the grating.

24. (Previously presented) The converter of Claim 23, wherein the mirror is disposed at an angle with respect to the grating such that the referenced, dispersed light is offset from the frequency modulated light signal which forms the input to the converter.

25. (Original) The converter of Claim 23, wherein the grating comprises a waveguide grating router.

26. (Original) The converter of Claim 23, wherein the grating comprises a diffraction grating.

27. (Currently amended) An optical communication system comprising:

an optical FM source operating in communication with a transmitter, the source being further capable of outputting a FM optical signal;

an optical transmission link for carrying the FM optical signal to a receiver;

~~an~~ a FM to IM converter in communication with the receiver, the converter including a frequency dependent disperser to disperse light associated with the FM optical signal such that a plurality of frequencies are coupled to a ~~frequency selective~~ modulator that modulates an intensity of one or more frequencies to generate a spatially mapped, dispersed signal and a frequency dependent combiner

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to produce an IM output signal that is linear with frequency over a selected bandwidth; and

a detector to detect IM signals.

28. (Currently amended) A method to convert input FM optical signals to IM optical output signals, comprising the steps of:

dispersing an FM input optical signal using a frequency dependent disperser to form a dispersed optical signal having a plurality of frequencies;

modulating the dispersed optical signal using a ~~frequency selective~~ modulator that spatially maps and alters a magnitude of one of the plurality of frequencies; and

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combining the dispersed optical signal using a frequency dependent combiner to form an intensity modulated output signal wherein the intensity modulated output signal is a varying function with respect to frequency over a selected bandwidth.

29. (Original) The method of Claim 28, wherein the intensity modulated output signal is linear with frequency over a selected bandwidth.

30. (Previously presented) The method of Claim 28, providing a frequency dependent modulator that modulates the dispersed frequencies as a function of spatial position such that the modulated output signal is linear with frequency.

31. (Currently amended) A method of filtering ~~an~~ a received optical signal comprising the steps of:

dispersing an FM input optical signal using a frequency dependent disperser to form a dispersed optical signal having a plurality of frequencies;

modulating the dispersed optical signal using a ~~frequency selective~~ modulator that modulates one of the plurality of frequencies using spatial mapping; and

combining the optical signal using a frequency dependent combiner to form an IM output signal that varies with frequency over a selected bandwidth.

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32. (Original) The method of Claim 31 further comprising collecting the input optical signal from a sample and forming a spectrum with the output signal.

33. (Currently amended) ~~The method of Claim 31 further comprising~~ A method of filtering a received optical signal comprising the steps of:

forming a plurality of filters in series or parallel, each filter having a disperser, an attenuator and a combiner [[.]] and comprising the steps of:

dispersing an FM input optical signal using a frequency dependent disperser to generate a dispersed optical signal having a plurality of frequencies;

modulating the dispersed optical signal using a spatial mapping modulator that modulates one of the plurality of frequencies; and

combining the optical signal using a frequency dependent combiner to generate an IM output signal that varies with frequency over a selected bandwidth.

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34. (Currently amended) A method to shape the transmission of ~~a~~ an optical signal with respect to frequency comprising the steps of:

dispersing an FM input optical signal using a frequency dependent disperser to form a dispersed optical signal having a plurality of frequencies;

modulating the dispersed optical signal using a ~~frequency selective~~ modulator that modulates at least one of the plurality of frequencies to generate a spatially mapped, dispersed signal; and

combining the dispersed optical signal using a frequency dependent combiner to form an IM output signal that is linear with frequency over a selected bandwidth.

REMARKS

Status of claims

Claims 1, and 3-34 remain in the application. Claims 1, 15, 16, 27, 28, 31, 33 and 34 have been amended. Applicant gratefully acknowledges the recognition of allowable subject matter in claims 15 and 33. Claims 15 and 33 have been amended to include the limitations of the respective independent claims along with those of any intervening claims. In claims 1, 15, 16, 27, 28, 31, 33 and 34 the limitation "frequency selective" with respect to modulator has been changed to generate a spatially mapped, dispersive signal to more clearly define the invention. Spatial mapping as applied to the modulator finds support in the specification in at least the following sections, page 11, lines 14-24 and page 13, line 21. No new matter has been added by way of these amendments. Applicant respectfully requests reconsideration of all claims in view of the foregoing remarks.

35 USC §103 Rejections

Independent claims 1, 16, 28, 31 and 34 stand rejected under 35 USC §103(a) as being unpatentable over Thompson et al. (US Patent No. 6,282,005B1). As the Examiner knows, a prima facie showing of obviousness under 35 USC §103(a) using a single reference requires (1) some suggestion or motivation, either in the reference itself or in the knowledge generally available in the art, to modify the reference; (2) a reasonable expectation of success in so modifying; and (3) that the prior art reference must teach or suggest all the claim limitations. *See MPEP §2143.* As the Applicant shows herein, the teachings of Thompson are incompatible with the apparatus, methods, and systems recited in Applicant's independent claims since the reference fails to teach or suggest the use of FM optical signals, or FM-IM conversion at a receiver. Furthermore, Thompson teaches the use of discrete frequencies (FIG. 4A), and fails to teach other elements of Applicant's claims such as a filter capable of modifying a continuum of frequencies, or wavelengths. Accordingly, Thompson is an inappropriate reference for a rejection based on 35 USC §103(a), and for at least these reasons, the requirements of a prima facie case of obviousness are not met.

Thompson discloses an optical surface plasmon-wave communications system for conveying optical signals from an optical transmitter to an optical receiver. In other

words, Thompson teaches an optical WDM transmitter which generates optical signals before conveying them to an output port coupled to an optical transmission fiber. Referring to Fig. 4, Thompson employs a surface plasmon wave (SPW) modulator 164 at optical transmitter 172 for generating intensity modulated (IM) signals for carrying information to optical receiver 170 via fiber 168. IM signals at the output of SPW modulator 164 are inputted into a WDM multiplexer 166 and then transmitted over fiber 168. As shown in Fig. 4 and described in col. 11, lines 7-34, a multiplexed stream of *intensity modulated (IM) signals* is transmitted from optical transmitter 172 to optical receiver 170. Thompson further describes the operation of SPW modulators and the corresponding IM signals at col. 9, line 66, to col. 10, line 3, and at col. 10, lines 51-56. In addition, Thompson transmits a signal comprised of a modulated stream of disparate wavelengths as shown in Fig. 4A.

In contrast, Applicant's invention comprises a filter, or FM to IM converter, having an input port and an output port capable of receiving a continuum of frequencies (claims 1, 16, 28, 31 and 34). In particular and with reference to Applicant's Fig. 4, a received RF signal 40, is converted to an optical signal, and then converted into a frequency modulated (FM) modulated signal using FM transmitter 42. The output of FM transmitter 42 is passed through an optical amplifier 44 prior to sending the *FM signal* over an optical fiber. Then, at a receiver, the FM signal is converted to an intensity modulated (IM) signal using FM-IM converter 50. The IM signal, *present at the receiver*, is then converted back into an RF signal at detector 52. Applicant's claims clearly recite elements distinguishing them from teachings of Thompson as set forth below.

Amended claim 1 recites, among other things, "a frequency dependent disperser that disperses a *frequency modulated input optical signal* to form a dispersed signal having a plurality of frequencies" (*emphasis added*). As recited in claim 1, the optical frequency filter receives a frequency modulated input optical signal. In contrast, the teachings of Thompson are limited to transmitting and receiving an intensity modulated signal over an optical link. In fact, Thompson is silent with respect to employing frequency modulation (FM), FM optical signals, or in disclosing a novel optical filter for any purpose. Therefore, Thompson cannot teach or suggest the use of FM optical signals alone or in conjunction with IM optical signals. For at least these reasons, claim 1 is

allowable over Thompson. Applicant respectfully requests allowance of claim 1 and claims 3-15 depending therefrom.

Amended claim 16 recites, among other things, "a frequency dependent disperser that disperses a frequency modulated light signal into a plurality of frequencies". Thompson fails to teach or suggest employing frequency modulated optical signals in any form. As such, the 35 USC §103(a) rejection of claim 16 should be withdrawn. Applicant respectfully requests allowance of claim 16 and claims 17-26 depending therefrom.

Amended claim 27 recites, among other things, "an optical FM source operating in conjunction with a transmitter, the source further capable of outputting an FM optical signal; an optical transmission link for carrying the FM optical signal to a receiver; at the receiver, an FM to IM converter". Thompson fails to teach or suggest a source outputting an FM optical signal, an optical transmission link for carrying an FM optical signal, or an FM to IM converter operating in a receiver. For at least the foregoing reasons, Applicant respectfully requests allowance of claim 27.

Amended claim 28 recites, among other things, "a method to convert input FM optical signals to IM optical output signals", and "dispersing an FM input optical signal using a frequency dependent combiner to form an intensity modulated output signal". Since Thompson fails to teach or suggest converting FM optical input signals to IM optical output signals and using a frequency dependent combiner to form an intensity modulated output signal, it cannot form the basis of a valid 35 USC §103(a) rejection of claim 28. Applicant respectfully requests allowance of claim 28 and those claims depending therefrom, namely claims 29 and 30.

Amended claim 31 recites, among other things, "a method of filtering a received optical signal comprising the steps of: dispersing an FM input optical signal", and "combining the optical signal using a frequency dependent combiner to form an IM output signal that varies with frequency over a selected bandwidth". Since Thompson fails to teach the use of FM input optical signals and using a frequency dependent combiner to form an IM output signal, the reference fails to support a valid 35 USC §103(a) rejection of claim 31. Applicant respectfully requests allowance of independent claim 31 and dependent claim 32.

Amended claim 34 recites, among other things, "dispersing an FM input optical signal using a frequency dependent disperser to form a dispersed optical signal having a

plurality of frequencies" and "combining the dispersed optical signal using a frequency dependent combiner to form an IM output signal". As previously discussed, Thompson fails to teach or suggest the use of FM optical signals. As such, Thompson cannot be used to support a valid 35 USC §103(a) rejection of claim 34. Applicant respectfully requests allowance of claim 34.

Based upon at least the arguments presented hereinabove, Thompson fails as a valid 35 USC §103(a) reference when taken alone, since the reference fails to (1) make some suggestion or motivation, either in the reference itself or in the knowledge generally available in the art, to modify the reference; (2) set forth a reasonable expectation of success in so modifying the reference; and (3) teach or suggest all the claim limitations. *See MPEP §2143.* Allowance of claims 1, 16, 27, 28, 31, 33 and 34 is respectfully requested in view of these arguments.

Claims 6, 7-11, 13, 14, 18-26 and 32 stand rejected under 35 USC §103(a) as being unpatentable over Thompson in view of Kurokawa et al. (US Patent No. 6,122,419). The Examiner alleges that Kurokawa discloses an arrayed waveguide grating (AWG) and that it would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Kurokawa with those of Thompson to obtain Applicant's invention. Applicant strenuously disagrees.

As previously discussed, Thompson fails to teach or suggest FM optical signals in any way. Furthermore, Thompson fails to teach or suggest converting an optical signal received at a receiver into an IM optical signal. Simply adding an AWG to the disclosure of Thompson does nothing to cure these, and other shortcomings. Therefore, Thompson and Kurokawa taken alone or in combination do not support a valid 35 USC §103(a) rejection of claims 6, 7-11, 13, 14, 18-26 and 32. Allowance of these claims is respectfully requested in light of the foregoing remarks.

Claim 12 is rejected under 35 USC §103(a) as being unpatentable over Thompson in view of Nelson (US Patent No. 3,766,392). As previously discussed, Thompson fails to teach or suggest numerous elements of Applicant's claimed invention including those of claim 12. Employing a prism and modulator from Nelson with the teachings of Thompson fails to cure these defects. As such, a valid 35 USC §103(a) rejection of claim 12 cannot be sustained utilizing Thompson and Nelson alone or in combination. Allowance of claim 12 is respectfully requested.

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CONCLUSION

In view of the amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone call would expedite the prosecution of this case, the Examiner is invited to call the undersigned at (508) 416-2474.

Respectfully submitted,
BOWDITCH & DEWEY, LLP

By Monica Grewal

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